

# Transition in Separating-Reattaching Boundary Layer Flows

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## Abstract

Experimental work with leading edge separation bubbles is presented to clarify the issues regarding transition in separated regions. Hot-wire measurements, in the form of oscilloscope traces, turbulence intermittency and conditionally sampled velocity distributions are given. The resulting points of transition onset and spot production rates are compared to existing correlations.



# **OUTLINE**

- 1) Problem**
- 2) Experiment**
- 3) Flow Results**
- 4) Intermittency Results**
- 5) Comparison to Correlations**
- 6) Conclusions**



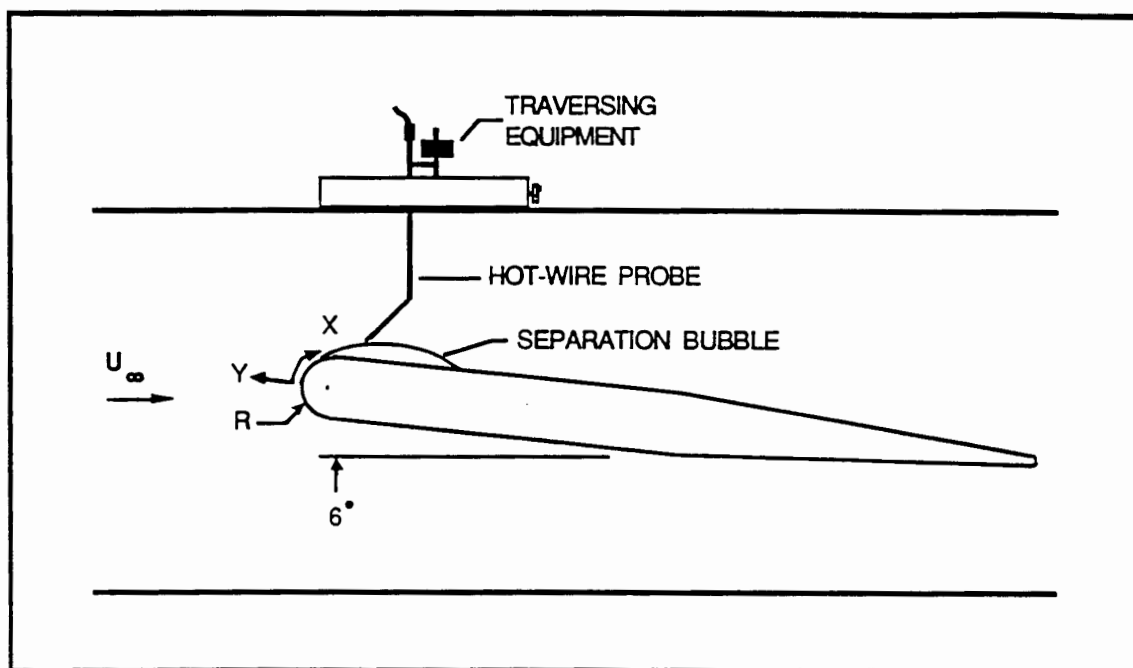


Fig. 1. Experimental Setup

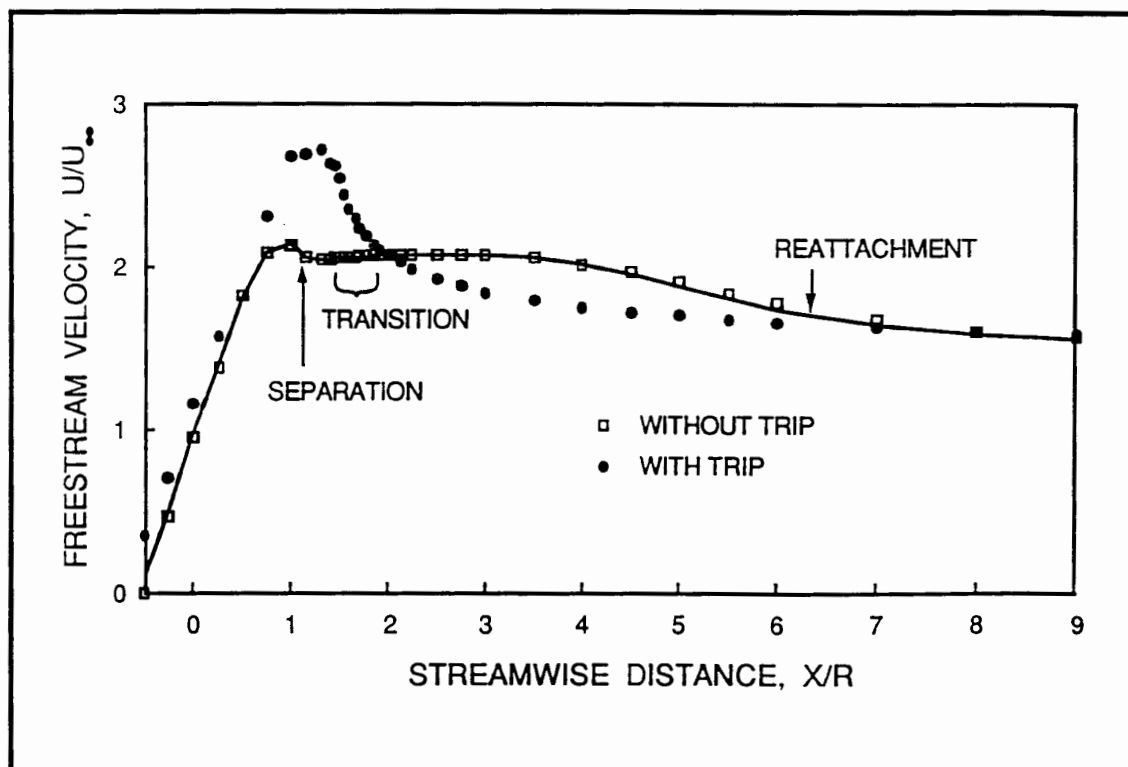
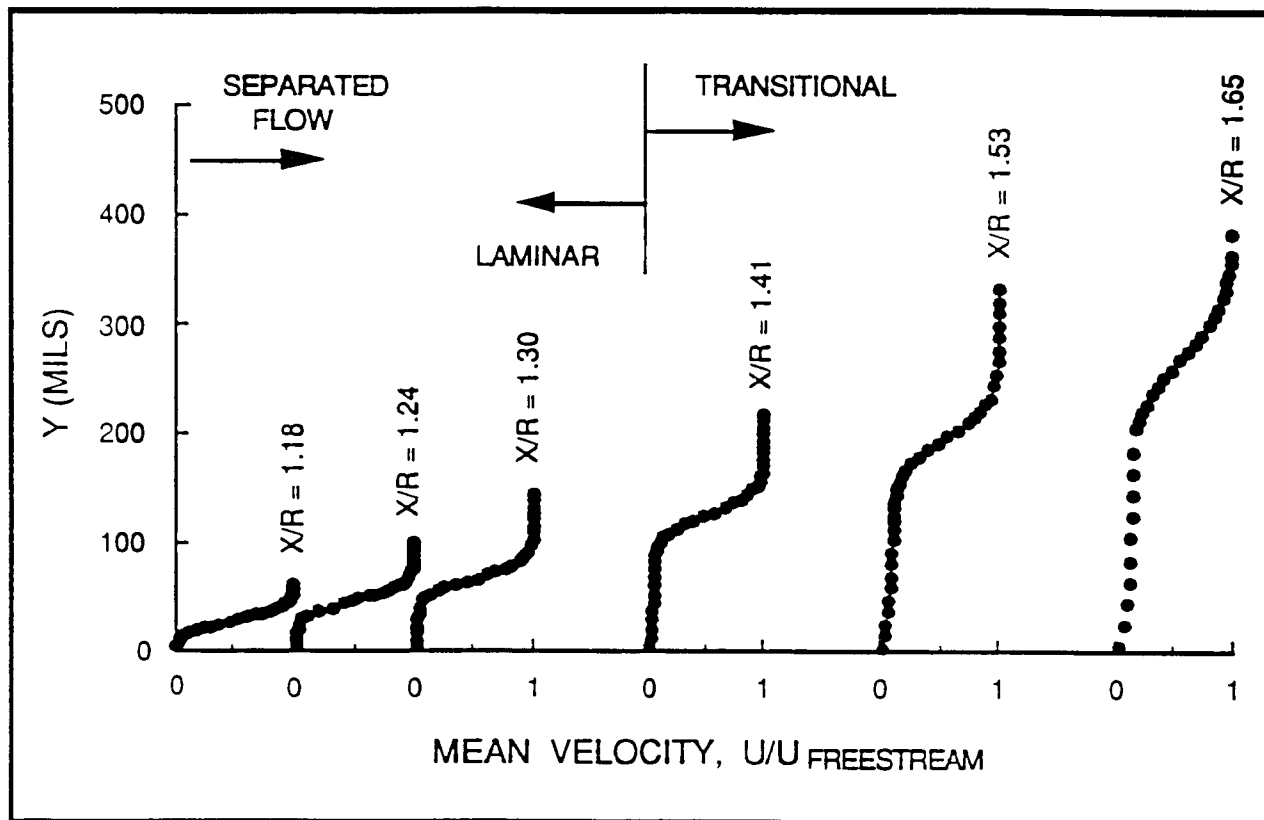


Fig. 2. Freestream Velocity



**Fig. 3.** Velocity Profiles

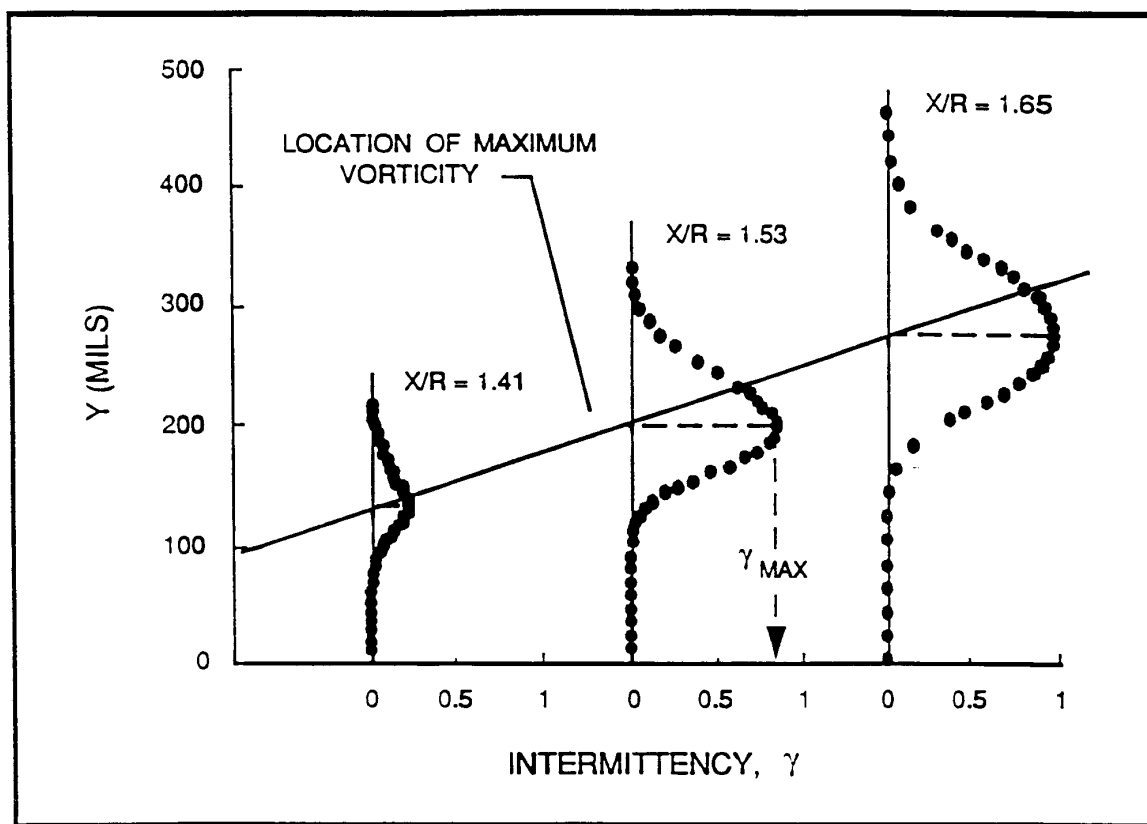


Fig 4. Intermittency Profiles

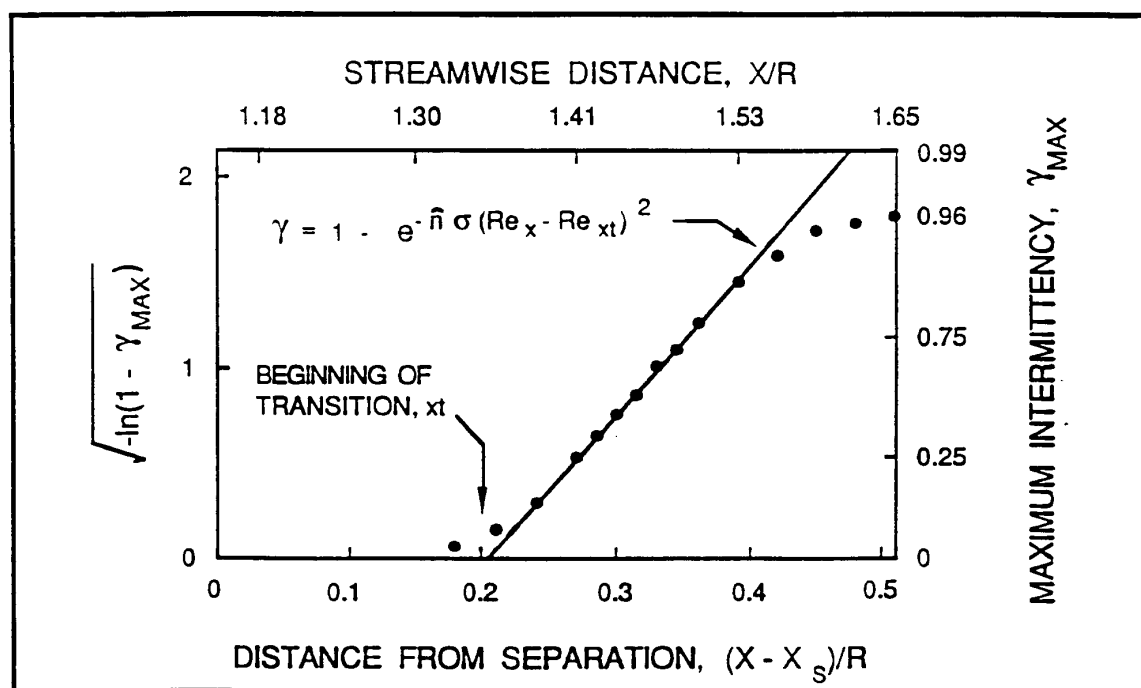


Fig. 5. Maximum Intermittency

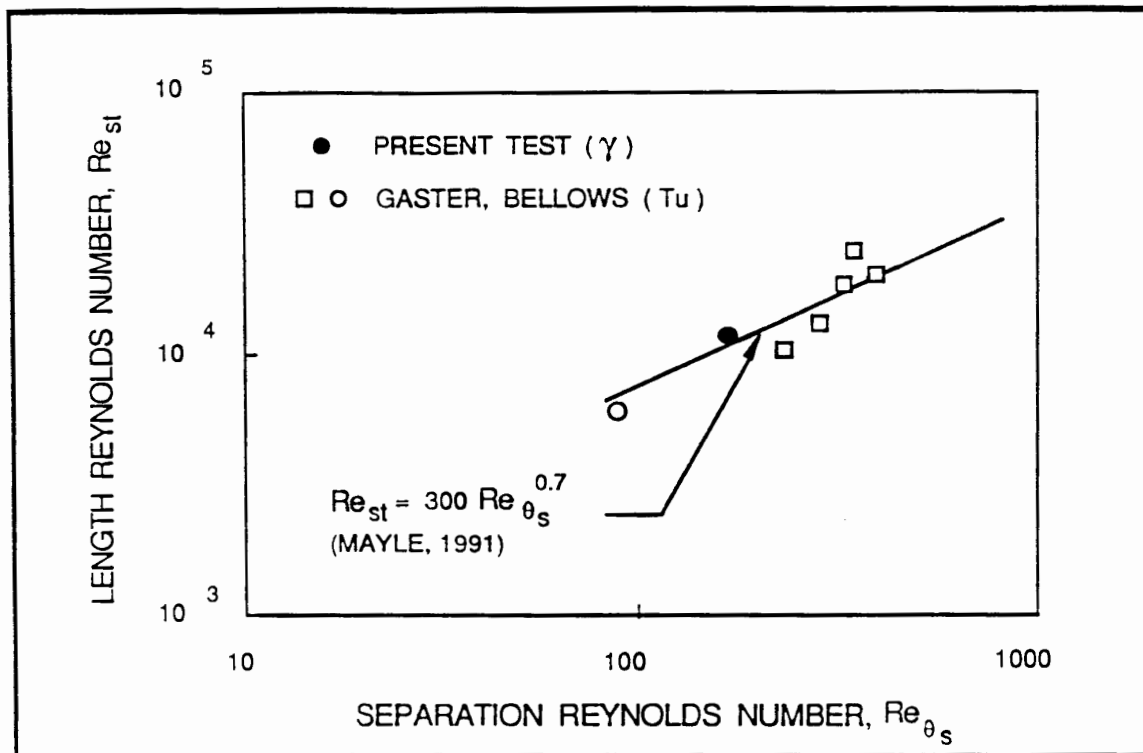


Fig 6. Beginning of Transition

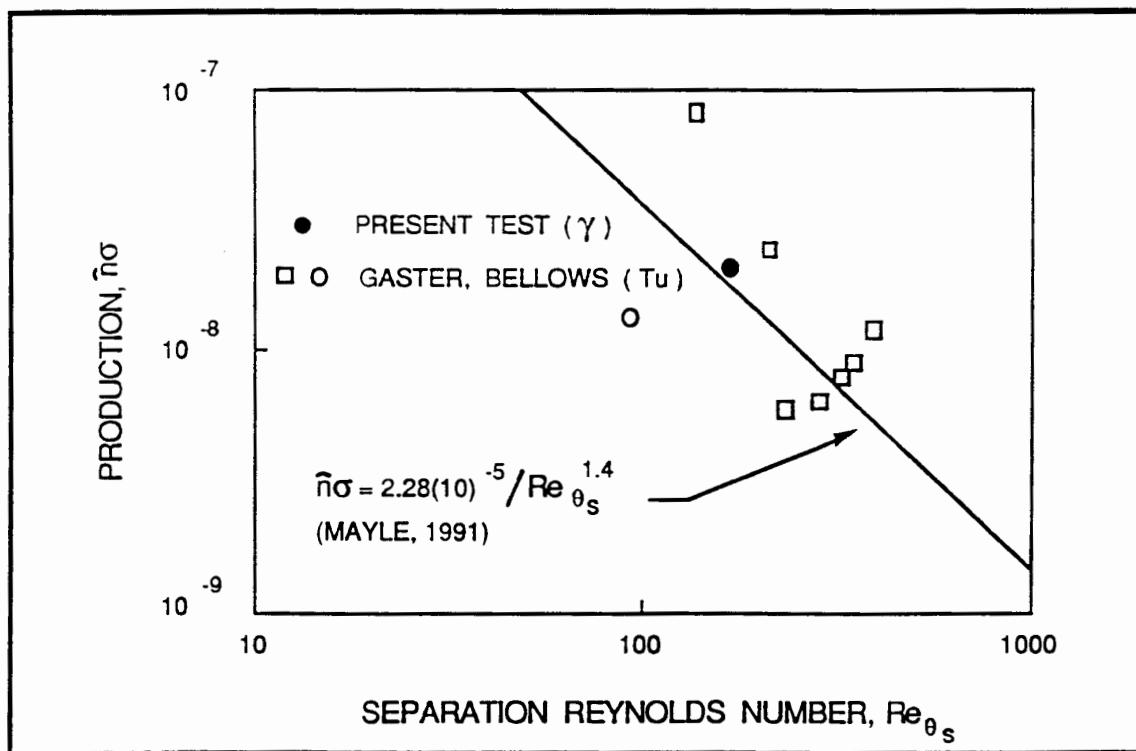


Fig. 7. Production Rate of Turbulent Spots



## **CONCLUSIONS**

- 1) Transition occurs within the separated shear layer.
- 2) Intermittency profiles in the transition region are roughly Gaussian.
- 3) Maximum intermittency lies along the line of maximum vorticity in the shear layer.
- 4) Maximum intermittency grows as turbulent spot theory predicts.
- 5) More intermittency measurements in separated flow are needed.
- 6) Mayle's correlations seem to be reliable based on the experimental data acquired thus far.

